

JAPANESE

[JP.08-205539,A]

Drawing selection Representative draw

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the converter which can improve a power-factor.

[0002]

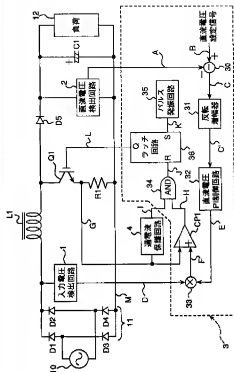
[Description of the Prior Art] The diode bridge 21 which is connected to AC power supply 20 and has the diode D11, D12, D13, and D14 as conventionally shown in drawing 6 as a converter, The reactor L2 by which the end was connected to the anode side output terminal of the above-mentioned diode bridge 21, The diode D15 for back run inhibition by which the anode was connected to the other end of the above-mentioned reactor L2, The capacitor C2 for smooth by which the end was connected to the cathode of the above-mentioned diode D15, The resistance R11 connected between the other end of the above-mentioned capacitor C2, and the negative electrode side output terminal of the diode bridge 21, Have the transistor Q2 to which the collector was connected to the anode of the above-mentioned diode D15, and the emitter was connected at the node of the capacitor C2 and the resistance R11, and, The SIN imitation circuit 22 which outputs the on-off signal which turns the transistor Q2 on and off in response to the signal showing the current which flows into the resistance R11 from the node of the above-mentioned resistance R11 and the negative electrode side output terminal of the diode bridge 21, In response to the signal showing the above-mentioned current, some are provided with the overcurrent protection circuit 23 which outputs an overcurrent detection signal to the SIN imitation circuit 22. The load 23 is connected to the both ends of the above-mentioned capacitor C2.

[0003] In the converter of the above-mentioned composition, the SIN imitation circuit 22 uses an on-off signal (shown in drawing 7(c)) as H level in falling of the constant frequency pulse (shown in drawing 7(b)) of the oscillating circuit which is not illustrated. If the above-mentioned on-off signal is set to H level, the both-outputs terminal of the diode bridge 21 will short-circuit it, and an input current will flow into direction of the arrow of the solid line of drawing 6. [the transistor Q2] And if an input current increases and an input current desired value is exceeded as shown in drawing 7(a), the SIN imitation circuit 22 will use an on-off signal as L level, and if the transistor Q2 is turned off, an input current will flow into direction of the arrow of the dotted line of drawing 6. When the above-mentioned transistor Q2 is OFF, it combines with the energy stored in the reactor L2, and electric power is supplied to the capacitor C2 and the load 23 from the diode bridge 21.

[0004] Thus, by repeating turning on and off of the transistor Q2 with the constant period of a constant frequency pulse, the input current from AC power supply 20 can be made to be able to follow in footsteps of input voltage and an in phase sine wave, and a power-factor can be improved.

[0005]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned converter, since the



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resistance R11 which performs current potential conversion is used as a means to detect an input current and an input current always flows into the resistance R11, there is a fault that the loss by the resistance R11 is large.

[0006] Then, the purpose of this invention is to provide the converter which can reduce the loss of the resistance which detects an input current.

[0007]

[Means for Solving the Problem] This invention is characterized by a converter of claim 1 comprising the following to achieve the above objects.

A reactor connected in series between both-outputs terminals of a rectification means connected to AC power supply, and a switching element.

A node of the above-mentioned reactor and the above-mentioned switching element.

A diode for back run inhibition and a capacitor for smooth which were connected in series between nodes of an output terminal of the above-mentioned rectification means, and the above-mentioned switching element.

Resistance which detects current which a series connection is carried out to the above-mentioned switching element among both the above-mentioned nodes, and flows into the above-mentioned switching element, A sinusoidal imitation means to turn the above-mentioned switching element on and off based on current which flows into the above-mentioned switching element detected by the above-mentioned resistance so that an input current of the above-mentioned rectification means may become an abbreviated sine wave according to an input voltage waveform, An overcurrent protection means to turn off the above-mentioned switching element based on current which flows into the above-mentioned switching element detected by the above-mentioned resistance if the above-mentioned input current of the above-mentioned rectification means becomes beyond a predetermined value.

[0008]

[Function] According to the converter of above-mentioned claim 1, if one [the above-mentioned switching element], the both-outputs terminal of a rectification means will connect with a reactor too hastily via resistance, and the input current from the above-mentioned AC power supply will flow into resistance via a rectification means and a reactor. And the current which flows into a switching element by the above-mentioned resistance is detected. Based on the current which flows into the switching element detected by the above-mentioned resistance, the above-mentioned sinusoidal imitation means turns a switching element on and off so that the input current of a rectification means may become an abbreviated sine wave according to an input voltage waveform. Based on the current which flows into the switching element detected by the above-mentioned resistance, the above-mentioned overcurrent protection means turns off a switching element, if the input current of a rectification means becomes beyond a predetermined value.

[0009] Thus, since the current which flows into the above-mentioned resistance turns into only current which flows when a switching element is one, it can reduce the loss by resistance.

[0010]

[Example] Hereafter, one example explains the converter of this invention in detail.

[0011] Drawing 1 shows the circuit diagram of the converter of one example of this invention. The diode bridge 11 which this converter is connected to AC power supply 10, and has the diode D1, D2, D3, and D4. The reactor L1 by which the end was connected to the anode side output terminal of the above-mentioned diode bridge 11, One end was connected to the cathode of the diode D5 for back run inhibition by which the anode was connected to the other end of the above-mentioned reactor L1, and the above-mentioned diode D5, and it has the capacitor C1 for smooth by which the other end was connected to the negative electrode side output terminal of the diode bridge 11. A collector is connected to the above-mentioned converter at the node of the reactor L1 and the diode D5, An emitter is provided with the transistor Q1 as a switching element connected to the negative electrode side output terminal of the diode bridge 11 via the resistance R1, and. It is connected to the anode side output terminal of the above-mentioned diode bridge 11, and the input voltage by which full wave rectification was carried out in the diode bridge 11 is detected, The input voltage detection circuit 1 which outputs the input voltage signal D, and DC voltage detection circuit 2 which outputs DC voltage signal A with which it is connected in parallel with the above-mentioned capacitor C1, and the both-ends voltage of the capacitor C1 is expressed, The SIN imitation circuit 3 as a sinusoidal imitation means to output on-off-signal L for turning the transistor Q1 on and off in response to the input voltage signal D from the above-mentioned input voltage detection circuit 1, and DC voltage signal A from DC voltage detection circuit 2, In response to the switch current transform signal G from the node of the emitter of the transistor Q1, and the resistance R1, it has the overcurrent protection circuit 4 as an overcurrent protection means to output the overcurrent protection signal I. The load 12 is connected to the both ends of the above-mentioned capacitor C1.

[0012]The subtractor 30 which the above-mentioned SIN imitation circuit 3 subtracts DC voltage signal A from the direct-current-voltage setpoint signal B in response to DC voltage signal A from DC voltage detection circuit 2, and the direct-current-voltage setpoint signal B, and outputs the direct-current-voltage deviation signal C, The inversed amplifier 31 which reverses the direct-current-voltage deviation signal C, and outputs direct-current-voltage deviation inversion signal C' in response to the direct-current-voltage deviation signal C from the above-mentioned subtractor 30, The direct-current-voltage PI control circuit 32 which outputs the direct-current-voltage control signal E in response to direct-current-voltage deviation inversion signal C' from the above-mentioned inversed amplifier 31, In response to the input voltage signal D from the above-mentioned input voltage detection circuit 1, and the direct-current-voltage control signal E from the direct-current-voltage PI control circuit 32, the multiplication of the input voltage signal D and the direct-current-voltage control signal E is carried out, The input current target signal F from the multiplier 33 which outputs the input current target signal F, and the above-mentioned multiplier 33 is connected to a non-inversed input terminal, Comparator CP1 by which the switch current transform signal G from the node of the emitter of the transistor Q1 and the resistance R1 was connected to the inversed input terminal, AND gate 34 by which the comparator output signal H from above-mentioned comparator CP1 and the overcurrent protection signal I from the overcurrent protection circuit 4 were connected to both input terminals, and the pulse oscillation circuit 35 which outputs the constant frequency pulse K, The constant frequency pulse K from the above-mentioned pulse oscillation circuit 35 is connected to set input terminal S, and the output signal J of AND gate 34 is connected to reset input terminal R, and it has the latch circuitry 36 which outputs on-off-signal L to the transistor Q1 from the output terminal Q.

[0013]The subtractor 30 of the above-mentioned SIN imitation circuit 3 subtracts DC voltage signal A (shown in [drawing 2 \(A\)](#)) from [from the direct-current-voltage setpoint signal B (shown in [drawing 2 \(B\)](#))] DC voltage detection circuit 2, and outputs the direct-current-voltage deviation signal C (shown in [drawing 2 \(C\)](#)). And in response to the above-mentioned direct-current-voltage deviation signal C, the inversed amplifier 31 reverses the direct-current-voltage deviation signal C, and outputs direct-current-voltage deviation inversion signal C'. In response to above-mentioned direct-current-voltage deviation inversion signal C', the direct-current-voltage PI control circuit 32 outputs the direct-current-voltage control signal E (shown in [drawing 2 \(E\)](#)) which obtained by performing PI (proportional action and integral action) control based on change of direct-current-voltage deviation inversion signal C'. Next, in response to the direct-current-voltage control signal E from the above-mentioned direct-current-voltage PI control circuit 32, and the input voltage signal D from the input voltage detection circuit 1 (shown in [drawing 2 \(D\)](#)), the multiplier 33 carries out the multiplication of the direct-current-voltage control signal E and the input voltage signal D, and outputs the input current target signal F. That is, it asks for the deviation of the output voltage of a converter from the set-up direct current voltage, and an input voltage waveform and the input current target signal F in phase are adjusted according to the deviation so that it may become the direct current voltage to which output voltage was set. And comparator CP1 compares the switch current transform signal G by which current potential conversion was carried out by the resistance R1 with the input current target signal F from the above-mentioned multiplier 33, and the comparator output signal H is outputted.

[0014][Drawing 3](#) and 4 show the signal of each part of the above-mentioned converter, and explain operation of a converter hereafter according to [drawing 3](#) and 4.

[0015]First, the above-mentioned latch circuitry 36 in a reset state. The transistor Q1 turns off on L level, and after full wave rectification of the on-off-signal L (shown in [drawing 3 \(L\)](#) and [drawing 4 \(L\)](#)) is carried out in the diode bridge 11, it flows through the input current from AC power supply 10 into the load 12 via the reactor L1 and the diode D5.

[0016]Next, the above-mentioned pulse oscillation circuit 35 outputs the constant frequency pulse K (shown in [drawing 3 \(K\)](#) and [drawing 4 \(K\)](#)), sets the latch circuitry 36 by falling of the constant frequency pulse K, and uses on-off-signal L as H level. If the above-mentioned on-off-signal L is set to H level, the both-outputs terminal of the diode bridge 11 will connect it with the reactor L1 too hastily by the resistance R1, and an input current will flow in order of the reactor L1, the transistor Q1, and the resistance R1. [the transistor Q1] At this time, the switch current transform signal G showing the current which flows into the transistor Q1 by the above-mentioned resistance R1 (shown in [drawing 3 \(G\)](#) and [drawing 4 \(G\)](#)) is acquired.

[0017]Next -- if the above-mentioned switch current transform signal G exceeds an input current desired value -- the comparator output ([drawing 3 \(H\)](#).) of comparator CP1 [drawing 4 \(H\)](#) -- being shown -- it is set to L level, and the output J of AND gate 34 serves as L level from H level, resets the latch circuitry 36, and uses on-off-signal L as L level.

[0018]And the input current M (shown in [drawing 3 \(M\)](#) and [drawing 4 \(M\)](#)) follows in footsteps of

an input voltage waveform and an in phase abbreviated sine wave by again with falling of the following constant frequency pulse K, and repeating the same operation. [the transistor Q1] [0019]Drawing 5 shows the signal of each part at the time of overcurrent protection operation of the overcurrent protection circuit 4. For example, if the above-mentioned comparator CP1 is damaged and H level becomes being an output of comparator CP1 with as, the latch circuitry 36 will no longer be reset. And it becomes that on-off-signal L of the above-mentioned latch circuitry 36 is H level with as, and the ON state of the transistor Q1 continues. If a switch current signal (slash part of drawing 5 (b)) exceeds an overcurrent protection value at this time in the above-mentioned overcurrent protection circuit 4, the overcurrent protection signal I will be used as L level from H level. And since the output of AND gate 34 will serve as L level, the latch circuitry 36 will be reset and on-off-signal L will be used as L level if the above-mentioned overcurrent protection signal I is set to L level. The transistor Q1 or other elements are prevented from being damaged according to an over-current by making the transistor Q1 into an OFF state.

[0020]Thus, since the input current from AC power supply 10 is made to follow in footsteps of input voltage and an in phase abbreviated sine wave by repeating turning on and off of the transistor Q1 so that the current which flows into the transistor Q1 to the above-mentioned input current desired value may follow in footsteps, a power-factor is improvable. The resistance R1 which detects the input current for the above-mentioned SIN imitation circuit 3 can be used also [means / to detect the over-current for the overcurrent protection circuit 4]. [0021]Therefore, since the input current from AC power supply 10 flows only when the transistor Q1 is one, and it does not flow into the above-mentioned resistance R1 when the transistor Q1 is OFF, ohm loss can be reduced.

[0022]Although the series connection of the resistance R1 which detects an input current to the emitter side of the transistor Q1 as a switching element was carried out to the transistor Q1 in the above-mentioned example, the series connection of the resistance may be carried out to the collector side of the transistor Q1. The switching element of not only a transistor but SCR (silicon controlled rectifier) etc. being used is natural.

[0023]Although the series connection of the reactor L1, the diode D5, and the capacitor C1 was carried out to the both-outputs terminal of the diode bridge 11 as a rectification means from the anode side in the above-mentioned example at order, the composition which carried out the series connection of a reactor, a diode, and the capacitor to order from the negative-electrode side of a rectification means may be used.

[0024]Although the SIN imitation circuit 3 was used as a sinusoidal imitation means in the above-mentioned example, Based on the current which flows into the switching element detected by not only this but resistance, the sinusoidal imitation means should just turn a switching element on and off so that the input current of a rectification means may become an abbreviated sine wave according to an input voltage waveform.

[0025]

[Effect of the Invention]As mentioned above, so that clearly the converter of an invention of claim 1, Carry out current potential conversion, and the resistance connected to a switching element and series detects the current which flows into a switching element, and a sinusoidal imitation means, Based on the current which flows into the switching element detected by the above-mentioned resistance, turn a switching element on and off so that the input current of a rectification means may become an abbreviated sine wave according to an input voltage waveform, and. Based on the current which flows into the switching element detected by the above-mentioned resistance, an overcurrent protection means turns off a switching element, if the above-mentioned input current becomes beyond a predetermined value.

[0026]Therefore, according to the converter of an invention of claim 1, when the above-mentioned switching element is one, the both-outputs terminal of a rectification means is connected with a reactor too hastily via resistance, and the input current from AC power supply flows into resistance via a rectification means and a reactor, and detects an input current by the resistance. Therefore, since current flows only when a switching element is one, and current does not flow into the above-mentioned resistance when a switching element is OFF, the loss of the resistance for detecting an input current can be reduced.

[Translation done.]